(19) World Intellectual Property Organization International Bureau



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(72) Inventors; and

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- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
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Published:

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: GST SEQUENCES FROM SOYBEAN AND THEIR USE IN THE PRODUCTION OF HERBICIDE RESISTANT **PLANTS**

(57) Abstract: The present invention relates to inter alia, Glutathione-S-Transferase (GST) and homoglutathione synthetase sequences from soybean and their use in the production of plants which are resitant to herbicides which comprise fomesafen and/or acifluorfen. In a particular embodiment the invention provides a GST depicted as SEQ ID No. 10 and a homoglutathione synthetase depicted as SEQ ID No. 1.



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| Applicant's or agent's file reference | | |
|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| PPD 50449/WO | | e Notification of Transmittal of International eliminary Examination Report (Form PCT/IPEA/416) |
| International application No | International filing date (day/month/year) | Pnonty date (day/month/year) |
| PCT/GB00/03573 | 18/09/2000 | 21/09/1999 |
| International Patent Classification (IPC) or n C12N9/00 | ational classification and IPC | |
| Applicant SYNGENTA LIMITED et al | | |
| This international preliminary exam and is transmitted to the applicant | | nis International Preliminary Examining Authority |
| 2 This REPORT consists of a total of | 7 sheets, including this cover sheet | • |
| been amended and are the ba | | cription, claims and/or drawings which have ning rectifications made before this Authority inder the PCT) |
| These annexes consist of a total of | sheets | |
| | • | |
| IV E Lack of unity of invention V Reasoned statement uncitations and explanation VI Certain documents cite VII Certain defects in the in | opinion with regard to novelty, inventive on inder Article 35(2) with regard to novelt ons suporting such statement and | e step and industrial applicability y, inventive step or industrial applicability, |
| Date of submission of the demand | Date of comple | tion of this report |
| 08/03/2001 | 22 01 2002 | |
| Name and mailing address of the international preliminary examining authority | Authorized office | rer |
| European Patent Office D-80298 Munich Tel +49 89 2399 • 0 Tx 523656 Fax +49 89 2399 • 4465 | ' | ppoulou. A +49 89 2399 8054 |

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No PCT/GB00/03573

| D | -44 | report |
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| I MARIS | OI INA | report |

| | Basis of the report | | | | | | | |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--|--|--|--|
| 1 | With regard to the elements of the international application (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70 16 and 70 17)) Description, pages: | | | | | | | |
| | 1-2 | 26 | as originally filed | . * | | | | |
| | Cla | aıms, No : | | | | | | |
| | 1-2 | 27 | as originally filed | | | | | |
| | Dra | awıngs, sheets. | | | | | | |
| | 1/4 | -4/4 | as originally filed | | | | | |
| | Se | quence listing part | t of the description, pages | | | | | |
| | 1-2 | 9, as originally filed | | | | | | |
| 2 | lan | guage in which the | guage, all the elements marked above were available or furnished international application was filed, unless otherwise indicated undayailable or furnished to this Authority in the following language | der this item | | | | |
| | | the language of a | translation furnished for the purposes of the international search | (under Rule 23 1(b)) | | | | |
| | | the language of pu | ublication of the international application (under Rule 48 3(b)) | · . | | | | |
| | | the language of a 55 2 and/or 55 3) | translation furnished for the purposes of international preliminary | examination (under Rule | | | | |
| 3 | | | eleotide and/or amino acid sequence disclosed in the internation y examination was carried out on the basis of the sequence listing. | | | | | |
| | Ø | contained in the in | ternational application in written form | | | | | |
| | \boxtimes | filed together with | the international application in computer readable form | | | | | |
| | | furnished subsequ | ently to this Authority in written form | · | | | | |
| | | furnished subsequ | ently to this Authority in computer readable form | • | | | | |
| | | | t the subsequently furnished written sequence listing does not go oplication as filed has been furnished | beyond the disclosure in | | | | |
| | | The statement that listing has been fu | t the information recorded in computer readable form is identical trinished | to the written sequence | | | | |
| 4 | The | e amendments have | resulted in the cancellation of | | | | | |
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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No PCT/GB00/03573

| j | Basis | of | the | report |
|---|-------|----|-----|--------|
| | | | | • |

| 1 | the an | receiving Office in | ments of the international application (Replacement sheets which response to an invitation under Article 14 are referred to in this re to this report since they do not contain amendments (Rules 70 16 | eport as "originally filed" | | | | |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--|--|--|--|
| | 1-2 | 26 | as originally filed | | | | | |
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| | Cla | aıms, No : | | | | | | |
| | 1-2 | 7 | as originally filed | | | | | |
| | Dre | awings, sheets. | | • | | | | |
| | | _ | and a second live follows | | | | | |
| | 1/4 | -4/4 | as originally filed | | | | | |
| | Sec | Sequence listing part of the description, pages | | | | | | |
| | 1-29, as originally filed | | | | | | | |
| | | | | | | | | |
| 2 | | Nith regard to the language, all the elements marked above were available or furnished to this Authority in the anguage in which the international application was filed, unless otherwise indicated under this item | | | | | | |
| | The | ese elements were | available or furnished to this Authority in the following language | , which is | | | | |
| | | the language of a | translation furnished for the purposes of the international search | (under Rule 23 1(b)) | | | | |
| | | the language of pi | ublication of the international application (under Rule 48 3(b)) | • | | | | |
| | | the language of a 55 2 and/or 55 3) | translation furnished for the purposes of international preliminary | examination (under Rule | | | | |
| 3 | With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing | | | | | | | |
| | Ø | contained in the in | sternational application in written form | | | | | |
| | × | filed together with | the international application in computer readable form | | | | | |
| | | furnished subsequ | ently to this Authority in written form | | | | | |
| | | furnished subsequ | ently to this Authority in computer readable form | • * | | | | |
| | □ | | t the subsequently furnished written sequence listing does not go pplication as filed has been furnished | beyond the disclosure in | | | | |
| | | The statement tha listing has been fu | t the information recorded in computer readable form is identical rnished | to the written sequence | | | | |
| 4 | The | amendments have | e resulted in the cancellation of | | | | | |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No PCT/GB00/03573

| | | the description, | pages | | | | |
|-----|-------------|--------------------------------------------|--------------------------------------------------------|------------------------|-----------------------|------------------|-------------|
| | | the claims, | Nos | | | | |
| | | the drawings, | sheets | | | • | |
| 5 | | | n established as if (some yond the disclosure as fi | | ts had not been ma | ide, since they | have beer |
| | | (Any replacement si report) | heet containing such am | endments must be I | referred to under ite | em 1 and anne | xed to this |
| 6 | Add | ditional observations, | ıf necessary | | | · · | |
| II. | Pric | ority | | | | | |
| 1 | | This report has been prescribed time limit | n established as if no prior the requested | onty had been claim | ed due to the failur | e to furnish wit | hin the |
| | | ☐ copy of the earl | er application whose pri | onty has been claim | ed | • | |
| | | ☐ translation of the | e earlier application who | se priority has been | claimed | | |
| 2 | | This report has been been found invalid | established as if no pric | ority had been claim | ed due to the fact t | hat the priority | claım has |
| | Thu date | • • | this report, the internation | nal filing date indica | ated above is consi | dered to be the | relevant |
| 3 | | litional observations, i separate sheet | f necessary | | | • | |
| | 860 | separate sneet | | | | | |
| V | Lac | k of unity of invention | on | | | • | |
| 1 | In re | esponse to the invitati | on to restrict or pay addi | tional fees the applic | cant has | · | |
| | | restricted the claims | | | | | |
| | | paid additional fees | | | | | |
| | | paid additional fees u | under protest | | | | 1 |
| | ☒ | neither restricted nor | paid additional fees | | | | |
| 2 | <u>.</u> | | that the requirement of use applicant to restrict or p | | not complied and ch | nose, according | g to Rule |
| 3 | This | Authority considers t | hat the requirement of u | nity of invention in a | ccordance with Rul | les 13 1, 13 2 a | and 13 3 is |
| | | | | | | | |

International application No PCT/GB00/03573

| | | complied with | | | | |
|----|------|--------------------------------------------------------|-----------|------------------|------------------------------------|-------------------------------------|
| | | not complied with for th | e follow | ing reaso | ons | ·. |
| 4 | | nsequently, the following imination in establishing | • | | national application were the sul | pject of international preliminary |
| | | ali parts | | | | |
| | Ø | the parts relating to clai | ıms Nos | 1-5, 26 | all completely and 14-25 all parti | ally |
| V. | | asoned statement unde tions and explanations | | | - | e step or industrial applicability; |
| 1 | Stat | tement | | | | |
| | Nov | velty (N) | Yes No | Claims Claims | 1, 2, 4, 6-27 3, 5 | |
| | | entive step (IS) | Yes | Claims | 1, 2, 4, 6-11, 26, 27 | |
| | inve | one trop (10) | No | _ | 3. 5, 12-25 | |
| | | ustrial applicability (IA) | | Claims | | |

2 Citations and explanations see separate sheet

Re Item II Priority

The present application validly claims priority from 21 09 1999. Any documents cited in the International Search Report as P documents have therefore not been considered as comprised in the prior art relevant for the present application.

Re Item IV

Lack of unity of invention

The present application lacks unity as required by Article 3(4)(iii) PCT and Rule 13 PCT. Unity of invention exists only when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding "special technical features", i.e. features that define a contribution which each of the inventions make over prior art. Each of the two groups of inventions listed above constitutes a separate, distinct invention for the following reason. The common concept linking these two groups is glutathione and homoglutathione metabolism Invention. I relates to herbicide detoxification by conjugation to thiol glutathione (GSH), catalysed by glutathione-S- transferase (GST). Invention II relates to the formation of homoglutathione (hGSH) catalysed by homoglutathione synthetase. Glutathione and homoglutathione as well as genes involved in their synthesis are already known from Frendo et al., 1999, Plant Journal 17, 215. Since no other "special" technical feature (Rule 13.2 PCT) could be identified to provide a linking concept between the two groups, each must be considered as a separate invention.

EXAMINATION REPORT - SEPARATE SHEET

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step r industrial applicability; citations and explanations supporting such statement

- 1.1 Reference is made to the following documents
 - D1 DATABASE EMBL [Online] ACCESSION NO AI440996, 16 March 1999 (1999-03-16) SHOEMAKER R ,, ET AL 'sa63f01 y1 Gm-c1004 Glycine max cDNA clone GENOME SYSTEMS CLONE ID Gm-c1004-3986 5' similar to TR O04562 O04562 T7N9 15 ,, mRNA sequence 'XP002163493
 - D2 DATABASE EMBL [Online] ACCESSION NO AI731664, 12 June 1999 (1999-06-12) BLEWITT M, 'BNLGHi10422 Six-day Cotton fiber Gossypium hirsutum cDNA 5' similar to (AF064201) glutathione S-transferase [Gossypium hirsutum]. mRNA sequence 'XP002163494
- 1.2 The following documents were not cited in the international search report. Copies of the documents are appended hereto
 - D3 WO 93 01294 (IMPERIAL CHEMICAL IND PLC) 21 January 1993 (21 01 93)
 - D4 WO 98 20144 (ZENECA Ltd) 14 May 1998 (14 05 98)
- 2 Novelty (Article 33(2) PCT)
 - The present application discloses methods for creating herbicide resistant plants using the soybean enzyme glutathione-S-transferase (GST) GST catalyses herbicide detoxification by conjugation to thiol glutathione or homoglutathione
- 2.1 D1 discloses a soybean EST that is 99.7% identical to SEQ ID No.14 of the present application over 372 nucleotides D1 is thus detrimental to the novelty and inventive step of claims 3 and 5
- 22 D2 discloses a cotton fiber EST that is 64 5% identical to SEQ ID No 14 of the present application over 580 nucleotides D2 is thus detrimental to the novelty and inventive step of claim 5
- Inventive step (Article 33(3) PCT)
- 3 1 D3 discloses transgenic tobacco plants overexpressing a maize GST subunit (GST-II-

EXAMINATION REPORT - SEPARATE SHEET

27) Heterologous expression of the maize GST under the control of a strong constitutive promoter (GST-II-27 or CaMV 35S) confers herbicide resistance directly correlated to the level of GST expression

D4 also discloses the generation of herbicide resistant plants by transgenic expression of heterologous two-component proteins comprising GST as a first component The teachings of D3 and D4 thus deprive the subject-matter of claims 12-25 of inventive activity

4 Industrial applicability (Article 33(4) PCT)

> The subject-matter of the present set of claims appears to be industrially applicable, thus fulfilling the requirements of Article 33(4) PCT



PATENT COOPERATIO REATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| | or agent's fil | e reference | FOR FURTHER A | ATIALI | Notification of Transmittal of International |
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| PPD 50449/WO | | | TOTAL OTTAL | - Prei | iminary Examination Report (Form PCT/IPEA/416) |
| | al application | No. | International filing date (| day/month/year) | Priority date (day/month/year) |
| PCT/GB | 00/03573 | | 18/09/2000 | | 21/09/1999 |
| Internation C12N9/0 | | ssification (IPC) or na | tional classification and IP | С | |
| Applicant | | | | | |
| SYNGE | NTA LIMIT | ED et al. | | | |
| | | | nation report has been coording to Article 36. | prepared by th | is International Preliminary Examining Authorit |
| 2. This | REPORT co | onsists of a total of | 7 sheets, including this | s cover sheet. | |
| t (| see Rule 70 | led and are the bas | is for this report and/or 07 of the Administrative | sheets contain | cription, claims and/or drawings which have ning rectifications made before this Authority nder the PCT). |
| 3. This | | ins indications rela | ting to the following iter | ns: | |
| II | ☑ Prior | rity | | | |
| III | | | | ovelty, inventive | e step and industrial applicability |
| IV | | of unity of invention | | | |
| V | | | nder Article 35(2) with r ons suporting such state | | y, inventive step or industrial applicability; |
| VI | , | ain documents cite | | | |
| VII | ☐ Cert | ain defects in the in | ternational application | | |
| VIII | ☐ Certa | ain observations or | the international appli | cation | |
| | | | | | |
| Date of sub | omission of th | e demand | | Date of comple | tion of this report |
| 08/03/20 | 01 | | | 22.01.2002 | |
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| | | 9 2399 - 0 TX. 523656 9 2399 - 4465 | ерши и | Telephone No. | 149 89 2399 8054 |



| 1. | ments of the international application (Replacement sheets which have been furnished response to an invitation under Article 14 are referred to in this report as "originally fit to this report since they do not contain amendments (Rules 70.16 and 70.17)): | ed to ïled" | | |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| | 1-2 | 26 | as originally filed | |
| | Cla | aims, No.: | | |
| | 1-2 | 27 | as originally filed | |
| | Dra | awings, sheets: | | |
| | 1/4 | -4/4 | as originally filed | |
| | Se | quence listing part | of the description, pages: | |
| | 1-2 | 9, as originally filed | | |
| 2. | lan | guage in which the i | juage, all the elements marked above were available or furnished to this Authority in international application was filed, unless otherwise indicated under this item. | the |
| | The | ese elements were a | available or furnished to this Authority in the following language: , which is: | |
| | | the language of a t | translation furnished for the purposes of the international search (under Rule 23.1(b)) |). |
| | | | blication of the international application (under Rule 48.3(b)). | |
| | | the language of a t 55.2 and/or 55.3). | translation furnished for the purposes of international preliminary examination (under | Rule |
| 3. | Witi | n regard to any nuc l rnational preliminary | leotide and/or amino acid sequence disclosed in the international application, the y examination was carried out on the basis of the sequence listing: | |
| | × | contained in the int | ernational application in written form. | |
| | \boxtimes | | he international application in computer readable form. | |
| | | | ently to this Authority in written form. | |
| | | | ently to this Authority in computer readable form. | |
| | | The statement that | the subsequently furnished written sequence listing does not go beyond the disclosulplication as filed has been furnished. | ıre in |
| | | The statement that listing has been fur | the information recorded in computer readable form is identical to the written sequen nished. | ıce |
| 4. | The | amendments have | resulted in the cancellation of: | |

International application No. PCT/GB00/03573

| | | the description, | pages: |
|-----|-------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| | | the claims, | Nos.: |
| | | the drawings, | sheets: |
| 5. | | • | established as if (some of) the amendments had not been made, since they have been yond the disclosure as filed (Rule 70.2(c)): |
| | | (Any replacement st report.) | neet containing such amendments must be referred to under item 1 and annexed to this |
| 6. | Ado | litional observations, i | f necessary: |
| II. | Pric | ority | - |
| 1. | | This report has been prescribed time limit | established as if no priority had been claimed due to the failure to furnish within the the requested: |
| | | ☐ copy of the earli | er application whose priority has been claimed. |
| | | ☐ translation of the | e earlier application whose priority has been claimed. |
| 2. | | This report has been been found invalid. | established as if no priority had been claimed due to the fact that the priority claim has |
| | Thu date | • • | this report, the international filing date indicated above is considered to be the relevant |
| 3. | | litional observations, i separate sheet | f necessary: |
| IV | . Lac | k of unity of invention | on |
| 1. | In re | esponse to the invitati | on to restrict or pay additional fees the applicant has: |
| | | restricted the claims. | |
| | | paid additional fees. | |
| | | paid additional fees u | under protest. |
| | Ø | neither restricted nor | paid additional fees. |
| 2. | | | that the requirement of unity of invention is not complied and chose, according to Rule applicant to restrict or pay additional fees. |
| 3 | This | Authority considers t | hat the requirement of unity of invention in accordance with Rules 13.1.13.2 and 13.3 is |

International application No. PCT/GB00/03573

| | | □ complied with. | | | | |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------|--------------------------------------------------------------------|--|
| | not complied with for the following reasons: | | | | | |
| 4. | | sequently, the following principles in the sequently, the following to the sequential transfer in the sequently in the sequen | | | national application were the subject of international preliminary | |
| | | all parts. | | | | |
| | × | the parts relating to clair | ns Nos. | 1-5, 26 a | all completely and 14-25 all partially. | |
| | | | | | | |
| ۷. | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement | | | | | |
| 1. | Stat | ement | | | | |
| | Nov | elty (N) | Yes: No: | Claims Claims | 1, 2, 4, 6-27 3, 5 | |
| | Inve | entive step (IS) | Yes: No: | | 1, 2, 4, 6-11, 26, 27 3, 5, 12-25 | |
| | Indu | strial applicability (IA) | Yes: No: | Claims Claims | 1-27 | |

2. Citations and explanations see separate sheet

international a

Re Item II Priority

1. The present application validly claims priority from 21.09.1999. Any documents cited in the International Search Report as P documents have therefore not been considered as comprised in the prior art relevant for the present application.

Re Item IV Lack of unity of invention

1. The present application lacks unity as required by Article 3(4)(iii) PCT and Rule 13 PCT. Unity of invention exists only when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding "special technical features", i.e. features that define a contribution which each of the inventions make over prior art. Each of the two groups of inventions listed above constitutes a separate, distinct invention for the following reason. The common concept linking these two groups is glutathione and homoglutathione metabolism. Invention I relates to herbicide detoxification by conjugation to thiol glutathione (GSH), catalysed by glutathione-S- transferase (GST). Invention II relates to the formation of homoglutathione (hGSH) catalysed by homoglutathione synthetase. Glutathione and homoglutathione as well as genes involved in their synthesis are already known from Frendo et al., 1999, Plant Journal 17: 215. Since no other "special" technical feature (Rule 13.2 PCT) could be identified to provide a linking concept between the two groups, each must be considered as a separate invention.





Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1.1. Reference is made to the following documents:
 - D1: DATABASE EMBL [Online] ACCESSION NO: Al440996, 16 March 1999 (1999-03-16) SHOEMAKER R.,, ET AL.: 'sa63f01.y1 Gm-c1004 Glycine max cDNA clone GENOME SYSTEMS CLONE ID: Gm-c1004-3986 5' similar to TR:O04562 O04562 T7N9.15.;, mRNA sequence.' XP002163493
 - D2: DATABASE EMBL [Online] ACCESSION NO: AI731664, 12 June 1999 (1999-06-12) BLEWITT M.,: 'BNLGHi10422 Six-day Cotton fiber Gossypium hirsutum cDNA 5' similar to (AF064201) glutathione S-transferase [Gossypium hirsutum], mRNA sequence.' XP002163494
- 1.2. The following documents were not cited in the international search report. Copies of the documents are appended hereto:
 - D3: WO 93 01294 (IMPERIAL CHEMICAL IND PLC) 21 January 1993 (21.01.93)
 - D4: WO 98 20144 (ZENECA Ltd) 14 May 1998 (14.05.98)
- 2. Novelty (Article 33(2) PCT)
 - The present application discloses methods for creating herbicide resistant plants using the soybean enzyme glutathione-S-transferase (GST). GST catalyses herbicide detoxification by conjugation to thiol glutathione or homoglutathione.
- 2.1. **D1** discloses a soybean EST that is 99.7% identical to SEQ ID No:14 of the present application over 372 nucleotides. **D1** is thus detrimental to the novelty and inventive step of claims 3 and 5.
- 2.2. **D2** discloses a cotton fiber EST that is 64.5% identical to SEQ ID No:14 of the present application over 580 nucleotides. **D2** is thus detrimental to the novelty and inventive step of claim 5.
- 3. **Inventive step** (Article 33(3) PCT)
- 3.1. D3 discloses transgenic tobacco plants overexpressing a maize GST subunit (GST-II-

27). Heterologous expression of the maize GST under the control of a strong constitutive promoter (GST-II-27 or CaMV 35S) confers herbicide resistance directly correlated to the level of GST expression.

D4 also discloses the generation of herbicide resistant plants by transgenic expression of heterologous two-component proteins comprising GST as a first component. The teachings of **D3** and **D4** thus deprive the subject-matter of claims 12-25 of inventive activity.

4. Industrial applicability (Article 33(4) PCT)

The subject-matter of the present set of claims appears to be industrially applicable, thus fulfilling the requirements of Article 33(4) PCT.

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date 29 March 2001 (29.03.2001)

PCT

(10) International Publication Number WO 01/21770 A3

Dept. of Biological Sciences, University of Durham, South

(51) International Patent Classification⁷: 15/52, 15/82, 9/10, 9/00, A01H 5/00

C12N 15/54,

Road, Durham DH1 3LE (GB).

- (21) International Application Number: PCT/GB00/03573
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18 September 2000 (18.09.2000)

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- (71) Applicant (for all designated States except US): SYN-GENTA LIMITED [GB/GB]; Fernhurst, Haselmere, Surrey GU27 3JE (GB).
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- (75) Inventors/Applicants (for US only): ANDREWS, Christopher, John [GB/GB]; Jealott's Hill International Research Centre, Brackhell, Berkshire RG42 6ET (GB). JEPSON, Ian [GB/GB]; Jealott's Hill International Research Centre, Bracknell, Berkshire RG42 6ET (GB). TOWNSON, Jane, Karen [GB/GB]; Jealott's Hill International Research Centre, Bracknell, Berkshire RG42 6ET (GB). EDWARDS, Robert [GB/GB]; Dept. of Biological Sciences, University of Durham, South Road, Durham DH1 3LE (GB). CUMMINS, Ian [GB/GB]; Dept. of Biological Sciences, University of Durham, South Road, Durham DH1 3LE (GB). SKIPSEY, Mark [GB/GB];

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770 A3

(54) Title: GST SEQUENCES FROM SOYBEAN AND THEIR USE IN THE PRODUCTION OF HERBICIDE RESISTANT PLANTS

(57) Abstract: The present invention relates to *inter alia*, Glutathione-S-Transferase (GST) and homoglutathione synthetase sequences from soybean and their use in the production of plants which are resitant to herbicides which comprise formesafen and/or acifluorfen. In a particular embodiment the invention provides a GST depicted as SEQ ID No. 10 and a homoglutathione synthetase depicted as SEQ ID No. 1.

Inc Al Application No PCT/GB 00/03573

C12N9/00

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C12N15/54 C12N15/52 C12N15/82 C12N9/10

A01H5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

 $\begin{array}{ll} \mbox{Minimum documentation searched (classification system followed by classification symbols)} \\ \mbox{IPC 7} & \mbox{C12N} & \mbox{A01H} \end{array}$

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EMBL, BIOSIS, EPO-Internal, CHEM ABS Data, WPI Data

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| Date of the actual completion of the international search | Date of mailing of the international search report | | |
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| European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016 | Maddox, A | | |

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| Applicant's or agent's file reference PPD50449/W0 | | of Transmittal of International Search Report 220) as well as, where applicable, item 5 below. |
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| International application No. | International filing date (day/month/year) | (Earliest) Priority Date (day/month/year) |
| PCT/GB 00/03573 | 18/09/2000 | 21/09/1999 |
| Applicant | | |
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| | been prepared by this International Searching Auting transmitted to the International Bureau. | hority and is transmitted to the applicant |
| This International Search Report con: X It is also accompanie | sists of a total of6 sheets. ed by a copy of each prior art document cited in this | s report. |
| 1. Basis of the report | | |
| | , the international search was carried out on the ba d, unless otherwise indicated under this item. | sis of the international application in the |
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| 2. Certain claims were | e found unsearchable (See Box I). | |
| 3. Unity of invention is | s lacking (see Box II). | |
| 4. With regard to the title, | | |
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| the text has been est | tablished by this Authority to read as follows: | |
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| 5. With regard to the abstract, | as submitted by the applicant | |
| the text has been est | as submitted by the applicant. tablished, according to Rule 38.2(b), by this Author m the date of mailing of this international search re | |
| 6. The figure of the drawings to be | published with the abstract is Figure No. | - |
| as suggested by the | applicant. | None of the figures. |
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International Application No

A. CLASSIFICATION OF SUBJECT MS IPC 7 C12N15/54 A01H5/00

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols) $IPC \ 7 \ C12N \ A01H$

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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| Special categories of cited documents: A' document defining the general state of the art which is not considered to be of particular relevance E' earlier document but published on or after the international filing date L' document which may throw doubts on priority claim(s) or which is all of the particular than a publication date of another. | To later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention Xocument of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone | | |
| which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filling date but later than the priority date claimed | "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family | | |
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| Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016 | Authorized officer Maddox, A | | |

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